

# TECHNOLOGY UTILIZATION WORKSHOP SUBJECTS STUDY

## SUPPLEMENT I

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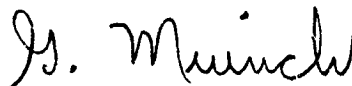
**TECHNOLOGY UTILIZATION  
WORKSHOP SUBJECTS STUDY**

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## **SECTION 1.0**

### **INTRODUCTION**

The National Aeronautics and Space Administration has, as one of its responsibilities, the obligation to "provide for the widest practicability and appropriate dissemination of information concerning its activities and the results thereof." This requirement, amplified to some extent by earlier NASA activities in the technology utilization area and by congressional and public debate on the NASA budget, has created a widespread interest in the possible utilization of space research and resulting developments by American industry. This interest is reflected within the NASA organization by the establishment of an active Technology Utilization Program.

In accordance with the requirement set forth in the National Aeronautics and Space Act of 1958, NASA has provided in recent contracts that its contractors and subcontractors submit data on any new development, material, process, techniques, etc., for NASA evaluation and possible dissemination to the nation's Scientific and Industrial Communities.

One of the methods of communication used to disseminate new technology to business, industry, and the public, is the sponsoring of symposia by NASA, usually in cooperation with an educational institution. These symposia are characterized by individual seminars, each covering a defined technological area, and known as Technology Utilization Workshops. On 2 June 1964, such a symposium was conducted jointly by NASA and the University of California at Los Angeles on the U. C. L. A. campus.

This supplement to the previously prepared study concerning Workshop subjects (Ref. NSL 64-125, dated April, 1964) has the following objectives:

1. Review the manner in which the Workshops were organized and conducted,
2. Analyze audience composition and the degree of participation,
3. Evaluate the extent of technology information dissemination and method used, and,
4. Offer conclusions and recommendations for the conduct of future Technology Utilization Workshops.

## SECTION 2.0

### DISCUSSION OF SYMPOSIUM ACTIVITIES

#### 2.1 PLENARY SESSION

2.1.1 A Plenary Session was conducted during the morning hours of 2 June to inform the participants of the basic and planned objectives of the NASA Technology Utilization Program, and to provide a round-table discussion which would explore the overall implications and critical areas involved with the mechanics of the technology utilization dissemination process. Recommendations for action were to result from the round-table discussion.

2.1.2 The purposes of the two opening presentations were adequately fulfilled. Dr. Werner Z. Hirsch, Director, Institute of Government and Public Affairs, UCLA, spoke on the Transformation of New Knowledge for Economic Growth. This excellent discourse was followed by an equally pertinent presentation by Dr. R.H. Brenneman, Technology Utilization Officer, NASA, Western Operations Office; on the NASA Program for Technology Utilization.

Dr. Hirsch pointed out that the normal dissemination or transformation of new knowledge often lags far behind its discovery, and that this time lag is completely inadequate for our present day growth requirements. Therefore, the transformation of new knowledge must be a managed transfer.

The choice of speakers and the material presented was completely appropriate to the subject under discussion and it was evident through observation of the audience that the desired depth of interest had been obtained.

2.1.3 The round-table discussion consisting of Chairman, Willard F. Libby, Director, Space Sciences Center, UCLA; Dr. George Simpson, of NASA, and seven prominent business and educational executives, highlighted the session. These distinguished individuals included: L.M.K. Boelter, Dean, College of Engineering, UCLA; Joseph B. Platt, President of Harvey Mudd College; H. Leslie Hoffman, President of Hoffman Electronics; Richard E. Horner, Senior Vice President, Northrop Corporation; Wendell B. Sell, President, Packard Bell Electronics; Kenneth Davis, Vice President, Bechtel Corporation; and A.E. Mann, President, Spectro Lab, Inc. These gentlemen were extremely well informed

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as to the objectives and critical areas connected with the NASA Technology Utilization Program, and were able to create an intensive interest on the subject through their outstanding abilities in expressing themselves. These gentlemen continually alluded to the magnitude of the task involved in the transformation of knowledge and to the economic problems connected with the reduction of new technology to practice and the marketing of such new technology. They generally agreed that the correct approach is to find specific needs and then match technological advances to them.

Mr. A. E. Mann considered that present NASA and other government agency controls, such as the data technology and patent clauses are restrictive in the business world and that a more liberal program in these areas is needed. Dr. Simpson spoke of the difficulty NASA has encountered in the identification of new technology and is working with pilot model programs in an experimental attempt to determine effective means for voluntary identification of new knowledge. Mr. W. B. Sell emphasized the problems of effective communication, especially among divisions of companies whose products are both consumer and government oriented. This led to more discussion on the subject of government procurement practices which tend to prevent the full exploitation of new technology. Dean Boelter discussed the time lag between the generation of knowledge, conception of need, and actual marketing of a new product for consumer utilization. He also stated that new knowledge must be reorganized for use. Mr. R. E. Horner gave a lucid account of the sequence of events leading to current government procurement and administrative procedures which have "quite successfully forestalled the use of information generated under government contract in industrial or consumer products." Mr. H. L. Hoffman stressed motivation in the form of tax reductions for commercial research (leading to the application of new technology). Mr. K. Davis expressed belief that an entrepreneur needs a unique position (exclusive use) of a government owned patent, possibly, a license from the government.

2.1.4 Although the round-table discussion did not result in a panacea resolving all problems connected with the NASA Technology Utilization Program, it formed a basis to stimulate and deepen the thinking by both the panel and the audience on the subject. The full impact of the discussion toward the eventual achievement of NASA Technology Utilization goals will probably not be felt abruptly, but will certainly be felt in the form of subtle influences which will serve to hasten the NASA Technology Utilization Program to a state of full maturity.

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**2.1.5** Although no specific recommendations for action resulted from the round-table due to the press of time the following are believed to be indicative of the opinions expressed:

1. Define specific industry and public needs, then bring applicable new technology to bear on the problem at symposiums of individuals related with the identified need.
2. Modify government procurement and administrative practices which tend to hamper the exploitation of government sponsored technological advances.
3. Modify government procurement practices which force diversified industries to administratively, financially, and physically divide their companies between government and consumer work.
4. Furnish a motivation for the accomplishment of commercial research beyond the original innovation resulting from NASA or government contracts.
5. Devise improved methods to identify new technology.

### **2.2 WORKSHOPS DISCUSSION**

Pursuant to the objective of the Technology Utilization Workshop Sessions, which is basically the transfer of new knowledge and its utilization, each workshop session has been analyzed to determine the extent of compliance. In addition, the manner in which the workshops were organized and conducted, the composition of the audience, and the degree of audience participation has been studied. The following paragraphs will discuss these aspects for each of the Workshop Sessions conducted during this symposium.

In general, the methods used to disseminate information in each of the Workshop Sessions followed a basic pattern, i.e., a lecture accompanied by visual aids such as charts, slides, movies, etc., followed by a discussion period.

#### **2.2.1 Workshop A - Space Electric Power Systems and Their Uses**

The workshop was chaired by Mr. Walter Menetry, Manager of Space Power Systems, Electro-Optical Systems, Inc., who introduced the guest speakers and monitored the general discussions.

The topics presented in this session included: (1) Biochemical Energy Conversion (Utilization of Industrial and Agricultural Wastes) by R. C. Bean, Philco Research Laboratories; Willard R. Scott, the Magna Corporation and George Ellis of the Marquardt Corporation, (2) Transferability of Space Power Systems Into Aircraft Power Systems by Philip

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Frankel of Lockheed Aircraft Corporation, (3) Solar Cell Applications by A. E. Mann of Spectro Lab, Inc., and (4) Hydrogen-Oxygen Fuel Cell by J. A. Wilson and R. B. West of Pratt and Whitney Aircraft Corporation.

Of the fifteen attendees present at this workshop, nine including the chairman and the guest speakers were from aerospace or associated industries. Five of the remaining six were from governmental agencies, and one was from private industry.

The material presented in this workshop session was generally well organized and well presented. However, the technical aspect of the material was not oriented to anticipated audience. As a result, the transfer of knowledge was not as great as it could have been had the lecturers had previous knowledge of the types of individuals who were to attend the workshop. In most cases, the subject matter dealt primarily with aerospace applications and accomplishments and was not oriented toward the possible transferability of technology to commercial fields.

In general, the success of this workshop session would have been significantly enhanced by the attendance of a greater number of representatives from commercial industries and by a more deliberate attempt by the lecturers to orient their presentations toward commercial applicability.

### **2.2.2 Workshop B - New Methods of Metal Forming**

This workshop was guided by Professor Donald S. Clark of the Physical Metallurgy Department, California Institute of Technology, who introduced each guest speaker.

Guest speakers included: Mr. L. Frost of North American Aviation, Inc., who spoke on Machining, Forming, Heat Aging and Processing for Saturn; Mr. M. A. Winter of General Atomics Division of General Dynamics Corporation, whose subject was Magnetic Pulse Forming; Mr. L. Gatzek of North American Aviation, Inc., S & ID Division, on Bonding and Welding of Dissimilar Metals and Mr. L. G. Elias of the Space and Missile Systems of Douglas Aircraft Company, who spoke on Stretch Forming Techniques.

The workshop was attended by twenty-three (23) people, including the chairman and the guest speakers. Approximately seventy percent of this group were representatives of aerospace firms, with the remaining thirty percent representing such widely diversified activities as concrete pipe manufacturers and research institutes.



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A review of the activity in this particular workshop indicates that a closer working relationship should be established between the workshop chairman and the guest speakers in order to maintain subject continuity and provoke audience participation. This could be accomplished by means of a brief meeting and a discussion of the subject matter by the chairman and guest speakers prior to the workshop session.

Audience participation, however, was good and the questions asked were pertinent and well phrased. Questions and comments were typical of the aerospace-oriented audience who were familiar with up-to-date metal forming techniques.

The material presented by the guest speakers was, in most cases, well organized and well delivered. However, the material was not oriented toward the workshop goal of disseminating material having commercial application. In fact, one presentation was almost a sales promotion for a particular type of forming machine. Other presentations were oriented almost 100 percent toward problems and their solutions as related to the Saturn program.

### **2.2.3 Workshop C - Materials Technology and Structures**

Mr. George A. Hoffman, of the Rand Corporation, served as Chairman of this particular workshop and in this capacity briefly outlined the subjects to be presented and introduced each speaker.

The subjects presented in this workshop included: Variable Geometry Structures by Dr. H. L. Sujata of the Northrop Space Laboratories, Sandwich Structures by Diffusion Bonding by Mr. J. E. Leach, of the Space and Missile Systems, Douglas Aircraft Company; Space and Missile Systems Materials Research by Mr. M. T. O'Shaughnessy of the Aerospace Corporation; Diversification Research on Materials by Mr. Morris Steinberg of Lockheed Aircraft Corporation; and Glass Reinforced Plastic Structures by Mr. R. H. Smith of Northrop Ventura.

Twenty people attended this workshop including five speakers and the workshop chairman. Of the companies and agencies represented in the workshop, approximately 20 percent had a clearly non-aerospace technical position, the remaining 80 percent were either completely aerospace oriented, or closely aligned to the so-called defense industries.

The effectivity of workshop "C" fell short of its potential usefulness because of low attendance in general, and the limited attendance by people not connected with the aerospace industry. Lists of select personnel should be developed and invitations extended to those with known interests in the subjects being presented in order to provide a larger response by people who represent, in part or totally, a non-aerospace commercial effort.

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Audience participation in this session was generally adequate and was particularly active for those subjects which had the greatest potential for commercial application. These included Sandwich Structures by Diffusion Bonding and Diversification Research on Materials.

The framework of this specific workshop would have materially benefited if it had been organized relative to subjects considered more appropriate for technology utilization; however, in general, the material was well organized, well delivered, and of interest to a major portion of the audience.

### **2.2.4 Workshop D - Advanced Valve and Pump Technology**

This workshop was chaired and monitored by Dr. Andrew W. Charwat, Professor of Engineering, College of Engineering, UCLA. Dr. Charwat opened the workshop with a brief statement about the intent of the session relative to the Technology Utilization Program and then introduced each of the guest speakers.

The subjects presented in this workshop were: Valve and Valve-Like Components by Mr. R. J. Salvinski of TRW Space Technology Laboratories; Advances in Pumping Technology and Rocket Engine Turbo-Pump Applications by Mr. C. A. MacGregor of the Rocketdyne Division of North American Aviation, Inc.; and Low N. P. S. H. Impeller Design by Mr. W. C. House of Aerojet-General Corporation.

The workshop was attended by ten people which included the chairman and three guest speakers. Aerospace oriented representatives made up about ninety percent of this small group.

The material presented in this workshop, with one notable exception, was moderately well organized. In one case, the presentation of material was deliberately shortened by the speaker because of a duplication or overlap of material presented by the previous speaker.

Audience participation was normal but slow in getting started. A pre-workshop meeting between the workshop chairman and participating speakers would have enabled the chairman to better understand the topics being discussed and thereby assist in the relationship between audience and speaker.

Inasmuch as this group was very small, composed almost entirely of aerospace representatives and the material, except in one case, not particularly oriented toward commercial application, it is believed that the basic aim of the workshop which was to disseminate new technology applicable to commercial usage was not fulfilled.

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### **2.2.5 Workshop E - Applied Biomedical Research**

Chairman: Dr. John French of the UCLA Brain Institute. Guest Speakers: Dr. Clarence Agress, Cedars of Lebanon Hospital who spoke on Vibrocardiology; Mr. J. G. Bitterley, Marquardt Corporation speaking on Applications of Extra-terrestrial Life Detection Systems; Mr. D. Carpenter, Marquardt Corporation speaking on the Applications of Space Biopac Concepts; J. W. Waggoner, M.D., Garrett Corporation who spoke on Bio-medical Monitoring Systems; S. Davis Bronson, M.D., Northrop Corporation, speaking on the Applications of Space Biomedical Research to Problems of Rehabilitation.

The workshop was attended by twenty-nine (29) individuals. Chairman Dr. French opened the workshop with appropriate statements as to the purpose and scope of the meeting. He then apportioned the time available in order to accommodate all of the speakers.

The material covered was excellently prepared and well presented, although somewhat limited by time. The audience was composed chiefly of aerospace representatives with some non-aerospace medical research individuals present. A high degree of interest was indicated by the many questions raised at the end of each presentation even though time limitations precluded any lengthy discussion periods.

Most of the speakers were able to relate their activities within the space programs directly to non-space applications. Therefore, the extent of technology information dissemination can be regarded as being excellent. Copies of the Dr. Bronson's paper were requested by many of the attendees and he was requested by a NASA official to consider the preparation of a proposal brief on a possible expansion of the subject area.

It is considered that the Biomedical Workshop was one of the more significant of the technological areas covered in the symposium in terms of attendance, interest, quality of presentations, and technology disseminated. It should also serve as an additional indication that the biomedical area will ultimately yield significant new technologies of great value to human health.

It was evident in this workshop, as possibly in others, that there exists a trade-off between time and the amount of material to be covered. An observation might be made that the number of speakers making presentations in Workshop "E" precluded nominal periods of questions and discussion. However, the amount of new knowledge disseminated is largely dependent upon the number of subjects covered. In this particular workshop, had it been desired to omit a lecture in order to allow more time for questions and discussion, the choice as to which to delete would have been very difficult.

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### **2.2.6 Workshop F - Developments in Electronics and Optics**

This workshop was efficiently directed and guided by Mr. Garth E. Sweetnam, Chief, Space Craft Power, Jet Propulsion Laboratory.

Guest speakers included Mr. G. Smith of the Hughes Malibu Research Laboratories, whose subject was Microelectronics; Mr. E. P. Martz, Jr., of Jet Propulsion Laboratories lectured on Imaging Systems; and Mr. F. Marzocco of the System Development Corporation, whose subject was Advanced Computer Applications.

Twenty-seven people including the chairman and guest speakers attended Workshop "F." Approximately 55 percent of the attendees in this workshop represented aerospace firms or businesses directly related to aerospace. The remaining 45 percent represented many diversified activities ranging from publishing firms to electronics companies.

The material presented by the lecturers in this workshop was subjectively well oriented. However, in general, the speakers reported on progress and accomplishments rather than techniques, processes, methods, etc., which would have been more applicable from a technology utilization standpoint.

Due to the short time span allotted to each lecturer and the quantity of material to be covered, audience participation was kept to a minimum. Significant interest, as indicated by the number and type of questions, was evident on the subjects of Laser Technology and Advanced Computer Applications.

Although time was a limiting factor in Workshop "F" and the audience was primarily aerospace oriented, it is considered that the workshop accomplished a satisfactory portion of its goal due to the fact that it brought together technical representatives of several related, and in some cases, rival industries to participate in the discussion on an exchange of new technology.

### **2.2.7 Workshop G - Management Concepts**

This workshop was capably guided and directed by Professor P. R. Cone of the University of Southern California, who introduced each lecturer and monitored the audience participation activities.

The subjects presented in this workshop were: Systems Integration Techniques by Mr. J. R. Summerfield of Douglas Aircraft Company, Inc.; PERT for Management Use by Mr. J. G. Sliney of Hughes Aircraft Company; Reliability Throughout Industry by Mr. J. Tamsen of Hughes Aircraft Company; Some Economic Questions of Technology Utilization

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by Mr. J. M. English, Department of Engineering, UCLA; and the Management of Research and Development by Mr. M. Hoffenberg of the Aerospace Corporation.

The workshop was attended by forty-five participants including the chairman and guest speakers. A show of hands indicated approximately 30 percent to be from the aerospace industry; a check of the attendance record, however, indicated that closer to 50 percent were from aerospace or closely related industries.

The topic "Management Concepts" was quite broad for one workshop session. The presentations occupied so much time that there was little time remaining for questions and discussion. The level of the presentations was such that the information was fairly common knowledge to the aerospace attendees but appeared to be "over the heads," or too complex for small business application. No attempt was made to inform the latter types how they could apply Systems Engineering, PERT, Reliability, etc., to their problems, in fact, their problems were not apparent. Admittedly, there is a tremendous amount of knowledge and information existing on Management Concepts, but the needs of each small business are different and will require a matching of techniques to needs. The observation was made by several attendees that small business is about twenty years behind the aerospace industry in knowledge of management techniques. However, they are ahead in regard to the competitive concepts such as return on investment, cost analysis, market analysis, etc. This fact may indicate that there is a possible beneficial "spill-in" from industry as well as "spill-out" from the aerospace industries. A free exchange of ideas would probably be most beneficial.

## **SECTION 3.0**

### **CONCLUSIONS AND RECOMMENDATIONS**

#### **3.1 CONCLUSION 1**

Despite certain problems which will be described later in this section, it is considered that the conduct of the symposium with its associated workshops was a successful venture of significant value to the NASA Technology Utilization Program, NASA, American industry, and the public. The earnest attitude exhibited by the speakers, panel, and workshop chairmen, coupled with solicited and unsolicited comments from participants indicates that a deep public interest does, indeed, exist. Future symposia, benefited by lessons learned from this one, can become a powerful media leading to increased effectiveness and wide public approval of the Technology Utilization Program.

##### **3.1.1 Recommendation**

NASA should plan additional symposia using a bold, confident approach, and utilizing lessons learned from this program as a basis for future planning. These lessons are discussed in the following conclusions.

#### **3.2 CONCLUSION 2**

The participants at the symposium were fewer in number than originally anticipated. In addition, the majority of attendees were from the aerospace industry while relatively few were from commercial industry. It is believed that this condition was caused by two factors:

1. The mailing list used by the university in forwarding the invitation brochures was not entirely valid in relation to the subject of the symposium. Despite assurances by their representatives to the NASA Technology Utilization Officer that their experience with these matters would produce an appropriate audience, the resulting response to the invitations was not adequate in this instance. A subsequent review of the mailing list used revealed that less than ten percent of those listed were considered appropriate recipients of invitations. In addition, a telephone survey of randomly selected recipients considered to be valid indicated that the mailing list was outdated as much as four years in some cases.

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2. The brochures which were mailed by the university announcing the symposium were considered as lacking in direct appeal to the specific types of technical and business individuals who could profit most from attending the session. Opinions were expressed that the title and title page of the brochure were not conducive to provide the desired reader interest required to open the folder. For example, a medical doctor or researcher receiving the brochure would be compelled to read the fine print before discovering that the symposium contained information of significant interest to him.

### **3.2.1 Recommendations**

1. Mailing lists used for announcement and invitation purposes relative to Technology Utilization Symposia should be carefully compiled under the direct cognizance of NASA, using the most recent data available from Chambers of Commerce, Industrial and Trade Associations, rosters of public officials, University Year Books, and officials of urban improvement associations.
2. The title page of brochure material should be arranged to be more indicative of what is to be found inside the folder. The title should be kept short and comprehensive.
3. A professional public relations representative should be utilized to advise and act on 1. and 2. above, and to work with the NASA Public Information and Technology Utilization Officers on timely and appropriate news releases.

### **3.3 CONCLUSION 3**

Although this report has consistently pointed out the ratio of aerospace to commercial participants at the symposium as being somewhat detrimental to the objectives of the symposium, it should be considered that the basic philosophy of inspiring new commercial and industrial enterprise has not been compromised. Furthermore, the symposium can be regarded as being highly appropriate to addressing the current nationwide concern in connection with the imminent conversion of various aerospace industrial elements to non-aerospace work. It is concluded, therefore, that the predominantly aerospace audience at this first regional Technology Utilization Symposium did not necessarily defeat the objectives of the

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NASA Technology Utilization Program, but may in fact, serve to reach into a higher order of managerial and investment capabilities necessary to effect the new technology translation and conversion process for eventual public benefit.

### **3.3.1 Recommendation**

A compatible mix of aerospace and non-aerospace participants should be sought for future symposiums.

### **3.4 CONCLUSION 4**

Reports on workshop activities indicate that the lack of time needed for question and discussion periods adversely affected the efficiency of workshops. In addition, there was one observation of a direct overlap of material in two consecutive presentations.

As the number of subjects covered within a workshop period is roughly proportional to the total amount of knowledge disseminated therein, either a maximum number of subjects should be covered (at the risk of degrading the amount of transfer per subject due to the lack of discussion time), or fewer subjects should be covered in order to assure adequate question and discussion time.

### **3.4.1 Recommendation**

Symposia should continue to cover as many subjects as possible in a workshop, but the overall efficiency of the transfer should be increased by:

- a. Obtaining advanced copies of material to be presented, editing out extraneous material, and assuring that no close similarities exist among presentations.
- b. Conducting a coordination meeting with the workshop chairman and speakers prior to the date of the symposium, acquainting the chairman with the nature of the subjects, determining an optimum time interval required for each presentation, placing presentations in the most appropriate sequence, editing presentations, as required, and utilizing visual and audio aids.
- c. Utilizing experience gained in previous technical and other symposia.